ABSTRACT

Disclosed is a method for correcting a nonlinearity error in a two-frequency laser interferometer which measures the phase angle using 90° phase mixing technique and a method for measuring a phase angle by using the same. The phase angle correcting method includes the steps of: calculating ellipse parameters, such as amplitudes, offsets and a phase difference of two sine and cosine output signals from the nonlinearity error correcting electronics; calculating an adjusting voltages for correcting offsets, amplitudes and a phase of the output signals; conducting a correction wherein offsets of output signals become zero, amplitudes are same, and a phase difference beyond 90° between the output signals becomes zero; and applying the output signals whose offsets, amplitudes and phase are corrected to Equation ($\theta=\arctan(I_y'/I_x')$) to calculate the phase angle. Therefore, the present invention has an advantage of drastically improving accuracy in the displacement measurement using the two-frequency laser interferometer by correcting the offsets, the amplitudes, the phases, or the likes with respect to the output signals of the 90° phase mixer and thus eliminating the periodic nonlinearity error generated in the two-frequency laser interferometer.

FIG.1

1: Laser

7: 90° phase shifter

9a:Low-pass filter

9b: Low-pass filter

400: Phase angle calculating electronics

FIG.2

FIG.3

Phase angle = $\arctan(I_X/I_Y)$

FIG.4

1: Laser

7: 90° phase shifter

16: Lookup table

9a: Low-pass filter

9b: Low-pass filter

400: Phase angle calculating electronics

FIG.5

Laser

7: 90° phase shifter

9a: Low-pass filter

9b: Low-pass filter

10: Phase angle calculating electronics

11a: Offset adjustment means

11b: Offset adjustment means

12a: Amplitude adjustment means

12b: Amplitude adjustment means

13: Phase adjustment means

14: Analogue-to-digital converter

15: Digital-to-analogue converter

17: Microprocessor

FIG.6

FIG.7

Phase angle ± arctan(I_x/I_y)

FIG.8

Error(degree)

Phase angle(degree)

After correction

Before correction

FIG.9

Nonlinearity error

Phase angle(degree)

After correction(according to the present invention)

Before correction